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Riemann's existence of holomorphic maps between compact Riemann surfaces

(Riemann's existence of holomotphic maps between compact Riemann surfaces)

Let Y be a compact Riemann surface, $\mathring{X}$ be a connected topological 2-manifold, $b_1, \dots, b_n \in Y$ and

$$\begin{array}{c} \mathring{X} \\ \downarrow \overset{\circ}{f} \\ \underbrace{Y}_{\substack{\text{compact} \\ \text{Riemann} \\ \text{surface}}} \setminus \{b_1, \dots, b_n\} \end{array}$$

↓
covering, finite degree

be a continous covering map of finite degree. Then there exists a compact Riemann surface X and a topological embedding

$$\iota_X : \mathring{X} \hookrightarrow \underbrace{X}_{\substack{\text{compact} \\ \text{Riemann} \\ \text{surface}}}$$

where the image is cofinite such that $\overset{\circ}{f}$ extends to an holomorphic map of compact Riemann surfaces

$$\begin{array}{c} X \\ \downarrow f \\ Y \end{array}$$

↓
holomorphic

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